

# Linyin Cheng, PhD

---

## Contact Information

216 UCB, University of Colorado Boulder campus, Boulder, CO 80309

NOAA/ESRL Physical Sciences Division R/PSD1, 325 Broadway, Boulder, CO, 80305

E-mail: [linyin.cheng@noaa.gov](mailto:linyin.cheng@noaa.gov)

## Education

- ✧ Ph.D. **University of California, Irvine**  
Civil and Environmental Engineering (Hydroclimate), 2014
- ✧ M.S. **Clarkson University**  
Civil and Environmental Engineering (Hydrodynamic), 2011
- ✧ B.S. **Sichuan University**  
Civil Engineering (Hydraulic and Hydroelectric), 2009
- ✧ B.S. **Sichuan University**, Second Bachelor's degree in Law, 2009

## Research Interests

- ✧ Hydrologic and Climatic Extremes
- ✧ (Conditional) Extreme Value Analysis
- ✧ Stationary and Non-stationary Processes
- ✧ Risk Analysis, Uncertainty Analysis
- ✧ Multivariate Analysis, (Vine) Copula
- ✧ Bayesian Modeling, Empirical Bayes
- ✧ Spatial and Temporal Stochastic Modeling
- ✧ Detection and Attribution

## Research Experience

- ✧ Research Associate, **CIRES, University of Colorado, Boulder** and **NOAA's ESRL/PSD** (10/2015 to present)
  - research focus: climate change impact assessment on water resources
  - research focus: assessing the individual and mutual effects of climate change and ENSO on climatic extremes
- ✧ Postdoctoral Scholar, **CIRES, University of Colorado, Boulder** and **NOAA's ESRL/PSD** (10/2014 – 10/2015)
  - research focus: develop frameworks for spatio-temporal extreme value analysis
- ✧ Advanced Study Program Graduate visitor, **NCAR** (6/2013 – 9/2013)
  - research focus: empirical Bayes estimation for the conditional extreme value model
  - research focus: develop the non-stationary extreme value analysis model (NEVA)
- ✧ Research Assistant, **University of California, Irvine** (9/2011 – 8/2014)
  - research focus: extreme value analysis in hydrology and climatology
  - Ph.D. dissertation: Frameworks for Univariate and Multivariate Non-stationary Analysis of Climatic Extremes
- ✧ Research Assistant, **Clarkson University** (8/2009 – 4/2011)
  - research focus: numerical modeling of river ice dynamics

## **Linyin Cheng, PhD**

---

- M.S. thesis: A Numerical Study on the upper St. Lawrence River Ice Dynamics and the Need for the Ice Sluice Gates

### **Teaching Experience and Interests**

- ✧ Teaching Assistant
  - Lectures in lab and discussion sessions, grade problem sets, papers and exams for Watershed Modeling course at UC-Irvine in 2013 and 2014 academic years
  - Lectures in lab and discussion sessions for Geographic Information System course at UC-Irvine in 2014 academic year
- ✧ Co-instructors
  - Guest lectures on multivariate extreme value analysis at CU-Boulder in 2015 academic year  
<http://civil.colorado.edu/%7Ebalajir/CVEN6833/lectures/Linyin-Copula-lecture-Dec8.pdf>
  - Guest lectures on extreme value analysis in Climate Data Analysis course at UC-Irvine in 2014 academic year
- ✧ Organizing Committee
  - Copulas for Hydrology and Climate Applications Workshop, UC-Irvine, 2014
- ✧ Peer Mentors
  - Mentor fellow graduate students at UC-Irvine in 2012 and 2013 academic years

### **Membership and Reviewer**

- ✧ Member of American Geophysical Union (AGU)
- ✧ Reviewer for:  
*Journal of Climate; Climate Research; Journal of Geophysical Research: Atmospheres; Theoretical and Applied Climatology; International Journal of Climatology; Climate; Scientific Reports; Natural Hazards and Earth System Sciences; Journal of Hydrology; Journal of Hydrologic Engineering; Risk Analysis; Environmental Modelling and Software; Advances in Statistical Climatology, Meteorology and Oceanography*

### **Fellowship, Honors and Awards**

- ✧ **AGU's Natural Hazards Focus Group Award for Graduate Research 2015**
- ✧ Received the **Cooperative Institute for Research in Environmental Sciences (CIRES) Fellowship** in Postdoctoral Program from 10/2014 – 10/2015
- ✧ Competitively selected for the **Advanced Study Program (ASP) Fellowship** in Postdoctoral Program at the National Center for Atmospheric Research (NCAR) in 2014
- ✧ **AGU's Outstanding Student Paper Awards (OSPAs) in Hydrology section**, for the AGU Fall meeting, 2013 poster “Non-stationary Extreme Value Analysis in a Changing Climate: A Software Package”
- ✧ Received the **Advanced Study Program** support to participate in the Graduate Visitor Program at the National Center for Atmospheric Research (NCAR) from 6/2013 – 9/2013

## Linyin Cheng, PhD

---

- ✧ **Teaching Assistantship and Graduate Research Scholarship** for Ph.D. research at UC-Irvine 2011 – 2014
- ✧ **Graduate Research Scholarship** for M.S. research at Clarkson University 2010 – 2011

### Scientific and Educational Software

#### Non-stationary Extreme Value Analysis (NEVA) Toolbox

By **Linyin Cheng** and Amir AghaKouchak

URL: <http://www.mathworks.com/matlabcentral/fileexchange/48238-nonstationary-extreme-value-analysis--neva--toolbox>

### Publications

1. **Cheng, L.**, AghaKouchak, A., Gilleland, E., Katz, R., 2014, Non-stationary Extreme Value Analysis in a Changing Climate, *Climatic Change*, 127, 353-369, doi: 10.1007/s10584-014-1254-5.

#### NEVA Toolbox

- (1) <http://www.mathworks.com/matlabcentral/fileexchange/48238-nonstationary-extreme-value-analysis--neva--toolbox>
- (2) <http://amir.eng.uci.edu/neva.php>
2. **Cheng, L.**, AghaKouchak, A., 2014, Nonstationary Precipitation Intensity-Duration-Frequency Curves for Infrastructure Design in a Changing Climate, *Scientific Reports*, 4, 7093, doi: 10.1038/srep07093.
3. **Cheng, L.**, Gilleland, E., Heaton, M., AghaKouchak, A., 2014, Empirical Bayes Estimation for the Conditional Extreme Value Model, *Stat*, 3, 391-406, doi: 10.1002/sta4.71.
4. AghaKouchak, A., **Cheng, L.**, Mazdiyasni, O., Farahmand, A., 2014, Global Warming and Changes in Risk of Concurrent Climate Extremes: Insights from the 2014 California Drought, *Geophysical Research Letters*, 41, 8847-8852, doi: 10.1002/2014GL062308. (on Research Spotlights of EOS)
5. **Cheng, L.**, AghaKouchak, A., 2015, A Methodology for Deriving Ensemble Response from Multimodel Simulations, *Journal of Hydrology*, 522, 49-57, doi: 10.1016/j.jhydrol.2014.12.025.
6. **Cheng, L.**, Phillips, T., AghaKouchak, A., 2015, Non-stationary Return Levels of CMIP5 Multi-model Temperature Extremes, *Climate Dynamics*, 44, 2947-2963, doi: 10.1007/s00382-015-2625-y.
7. Nasrollahi, N., AghaKouchak, A., **Cheng, L.**, Damberg, L., Phillips, T., Miao, C., Hsu, K., and Sorooshian, S., 2015, How Well Do CMIP5 Climate Simulations Replicate Historical

## **Linyin Cheng, PhD**

---

- Trends and Patterns of Meteorological Droughts?, *Water Resources Research*, 51, 2847-2864, doi: 10.1002/2014WR016318.
8. **Cheng, L.**, Hoerling, M., AghaKouchak, A., Livneh, B., Quan, X., Eischeid, J., 2016, How Has Human-Induced Climate Change Affected California Drought Risk?, *Journal of Climate*, 29.1, 111-120, doi: 10.1175/JCLI-D-15-0260.1
  9. Hoerling, M., Eischeid, J., Perlwitz, J., Quan, X., Wolter, K., **Cheng, L.**, 2016, Characterizing Recent Trends in U.S. Heavy Precipitation, *Journal of Climate*, 29, 2313-2332, doi: 10.1175/JCLI-D-15-0441.1
  10. Hoell, A., Hoerling, M., Eischeid, J., Wolter, K., Dole, R., Perlwitz, J., Xu, T., **Cheng, L.**, 2016, Does El Niño Intensity Matter for California Precipitation?, *Geophysical Research Letters*, 43, 819-825, doi: 10.1002/2015GL067102
  11. Madadgar, S., AghaKouchak, A., Shukla, S., Wood, A., **Cheng, L.**, Hsu, K., Svoboda, M., 2016, A Hybrid Statistical-Dynamical Framework for Meteorological Drought Prediction: Application to the Southwestern United States, *Water Resources Research*, 52, 5095-5110, doi: 10.1002/2015WR018547
  12. Bracken, C., Rajagopalan, B., **Cheng, L.**, Kleiber, W., Gangopadhyay, S., 2016, Spatial Bayesian Hierarchical Modeling of Precipitation Extremes over a Large Domain, *Water Resources Research*, 52, 6643-6655, doi: 10.1002/2016WR018768
  13. Wolter, K., Hoerling, M., Eischeid, J., **Cheng, L.**, 2016, What History Tells us about 2015 U.S. Daily Rainfall Extremes [in "Explaining Extremes of 2015 from a Climate Perspective"], *Bulletin of the American Meteorological Society*, 97, S9-S13, doi:10.1175/BAMS-D-16-0166.1
- Under Revision:
14. Song, X., Zhang, J., AghaKouchak, A., Xuan, Y., Kong, F., Zhan, C., Zhu, K., **Cheng, L.**, 2016, Assessing changes in precipitation extremes in the Beijing metropolitan area from 1960-2012: Spatio-temporal characteristics, possible causes, and implications, *Journal of Hydrology (under revision)*
- Under Review:
15. **Cheng, L.**, Hoerling, M., Smith, L., Eischeid, J., 2016, Assessing the Individual and Mutual Effects of Climate Change and ENSO on Extreme Events, *Journal of Climate (under review)*
  16. Ragno, E., AghaKouchak, A., Love, C., **Cheng, L.**, and Lima, C., 2016, Quantifying Climate Change Impacts on the Intensity-Duration-Frequency of Extreme Precipitation across the United States, *Proceedings of the National Academy of Sciences (under review)*

## **Linyin Cheng, PhD**

---

### In Preparation:

17. **Cheng, L.**, Hao, Z., Thorstensen, A., Rajagopalan, B., 2016, A Bayesian Framework for Assessing Contributions of Underlying Factors to Compound Events via Vine Copula
18. **Cheng, L.**, Rajagopalan, B., AghaKouchak, A., Bracken, C., 2016, A Non-stationary Spatio-temporal Framework for Climate Informed Extreme Precipitation Analysis
19. Yang, P., **Cheng, L.**, Ng, T., 2016, Quantifying Uncertainty of Return Periods for Multiple Extremes: A Comparison between Bootstrapping and Markov Chain Monte Carlo
20. Perlwitz, J., Xu, T., **Cheng, L.**, Hoerling, M., Wolter, K., Barsugli, J., 2016, Linking Extreme Weather Events and Extreme ENSO States

### **Technical Reports**

1. Skahill, B., AghaKouchak, A., **Cheng, L.**, Byrd, A., Kanney, J., Bayesian Inference of Nonstationary Precipitation Intensity-Duration-Frequency Curves for Infrastructure Design, 2016, US Army Corps of Engineers ERDC/CHL, CHETN-X-2
2. **Cheng, L.**, Huang, F., Knack I., and Shen, H., 2011, A Study on the Need of Ice Sluice Gates for St. Lawrence/FDR Power Project, Report to New York Power Authority

### **Selected Conference Papers, Presentations and Posters**

- ✧ Bracken, C., Rajagopalan, B., **Cheng, L.**, Gangopadhyay, S., Efficient Bayesian Hierarchical Modeling of Spatial Precipitation Extremes, Proceedings of the Fifth International Workshop on Climate Informatics: CI 2015. J. G. Dy, J. Emile-Geay, V. Lakshmanan, Y. Liu (Eds.). September 2015. ISBN: 978-0-9973548-0-5  
<https://www2.cisl.ucar.edu/sites/default/files/25-%20Bracken.pdf>
- ✧ **Cheng, L.**, Hoerling, M., Smith, L., Eischeid, J., Assessing the Individual and Mutual Effects of Climate Change and ENSO on Extreme Events, CIRES Review, August 29-31, 2016, NOAA, Boulder, CO, USA  
[http://cires.colorado.edu/sites/default/files/review/day1/theme2/1\\_Cheng\\_CIRES\\_Review\\_2016.pdf](http://cires.colorado.edu/sites/default/files/review/day1/theme2/1_Cheng_CIRES_Review_2016.pdf)
- ✧ Yang, P., **Cheng, L.**, Ng, T., 2016, Quantifying Uncertainty of Return Periods for Multiple Extremes: A Comparison between Bootstrapping and Markov Chain Monte Carlo, AOGS 13<sup>th</sup> Conference, 31<sup>st</sup> July to 5<sup>th</sup> Aug, 2016, Beijing, China  
<http://www.meetmatt-svr3.net/aogs/aogs2016/mars2/pubViewAbs.asp?sMode=oral&sectionIdO=3&dayRank=1&submit=Browse+Abstracts>
- ✧ Hoerling, M., **Cheng, L.**, Smith, L., Eischeid, J., Some Lessons in Event Attribution: The Texas/Oklahoma Rains of May 2015, The International Detection and Attribution Group (IDAG), February 1-3, 2016, NCAR, Boulder, CO, USA  
[https://www2.cisl.ucar.edu/sites/default/files/Hoerling%20-%20Extreme%20SPlains%20Rains\\_May2015\\_IDAGTalk.pdf](https://www2.cisl.ucar.edu/sites/default/files/Hoerling%20-%20Extreme%20SPlains%20Rains_May2015_IDAGTalk.pdf)

## Linyin Cheng, PhD

---

- ✧ **Cheng, L.**, Hoerling, M., AghaKouchak, A., Livneh, B., Quan, X., Eischeid, J., How Has Human-induced Climate Change Affected California Drought Risk?, AGU Fall Meeting, December 14-18, 2015, San Francisco, California, USA.  
<https://agu.confex.com/agu/fm15/webprogram/Paper70801.html>
- ✧ Bracken, C., Rajagopalan, B., **Cheng, L.**, Gangopadhyay, S., Coupled Bayesian Hierarchical Modeling of Streamflow and Precipitation Extremes, AGU Fall Meeting, December 14-18, 2015, San Francisco, California, USA.  
<https://agu.confex.com/agu/fm15/webprogram/Paper82288.html>
- ✧ Madadgar, S., **Cheng, L.**, Wood, A., Svoboda, M., AghaKouchak, A., A Hybrid Framework for Improving NMME Precipitation Forecasts, AGU Fall Meeting, December 14-18, 2015, San Francisco, California, USA.  
<https://agu.confex.com/agu/fm15/webprogram/Paper73705.html>
- ✧ Ragno, E., **Cheng, L.**, Cui, X., AghaKouchak, A., Nonstationarity in Extremes and Changes in Flood Risk in a Warming Climate, International Conference on Advances in Extreme Value Analysis and Application to Natural Hazards, Sep. 16-18, 2015, Santander, Spain  
[http://evan2015.ihcantabria.com/wp-content/uploads/2015/09/Program\\_EVAN2015.pdf](http://evan2015.ihcantabria.com/wp-content/uploads/2015/09/Program_EVAN2015.pdf)
- ✧ **Cheng, L.**, Current Effects of Human-induced Climate Change on California Drought, ESRL Physical Sciences Division Review 2015, May 12-14, 2015, NOAA, Boulder, CO, USA  
<http://esrl.noaa.gov/psd/events/2015/review/pdf/presentations/psd-review-theme2b-cheng.pdf>
- ✧ **Cheng, L.**, Spatio-temporal Frameworks of Extreme Value Analysis: Applications to Understanding and Modeling the Current California Drought and Rainfall Extremes, April 29<sup>th</sup>, 2015, University of Colorado, Boulder, Boulder, CO, USA  
<http://civil.colorado.edu/%7Ebalajir/waterseminar/Spring-15/linyin-abst.txt>
- ✧ **Cheng, L.**, Hoerling, M., AghaKouchak, A., Livneh, B., Quan, X., Multivariate Assessment on the Role of Climate Change in California Drought, AGU Chapman Conference, April 20-22, 2015, University of California, Irvine, Irvine, CA, USA  
<https://agu.confex.com/agu/15chapman1/webprogram/Paper37054.html>
- ✧ Mazdiyasni, O., AghaKouchak, A., **Cheng, L.**, Farahmand, A., Multivariate Hot-Drought Risk Assessment: The 2014 California Drought, AGU Chapman Conference, April 20-22, 2015, University of California, Irvine, Irvine, CA, USA  
<https://agu.confex.com/agu/15chapman1/webprogram/Paper37002.html>
- ✧ **Cheng, L.**, Rajagopalan, B., AghaKouchak, A., Bracken, C., A Generalized Spatio-temporal Framework for Climate Informed Extreme Precipitation Analysis, Hydrology Days, March 23-25, 2015, Colorado State University, Fort Collins, CO, USA  
[https://wsnet.colostate.edu/cwis312/hydrologydays/Abstracts\\_15/Linyin\\_abs.pdf](https://wsnet.colostate.edu/cwis312/hydrologydays/Abstracts_15/Linyin_abs.pdf)
- ✧ Bracken, C., Rajagopalan, B., **Cheng, L.**, Gangopadhyay, S., A Spatial Bayesian Hierarchical Modeling Approach for Precipitation Extremes, Hydrology Days, March 23-25, 2015, Colorado State University, Fort Collins, CO, USA  
[https://wsnet.colostate.edu/cwis312/hydrologydays/Abstracts\\_15/Cbracken\\_abs.pdf](https://wsnet.colostate.edu/cwis312/hydrologydays/Abstracts_15/Cbracken_abs.pdf)
- ✧ **Cheng, L.**, Hoerling, M., AghaKouchak, A., Livneh, B., Quan, X., Extreme Value Theory and the California Drought: Multivariate Assessment on the Role of Climate Change in

## **Linyin Cheng, PhD**

---

California Drought, The International Detection and Attribution Group (IDAG), January 21-23, 2015, NCAR, Boulder, CO, USA

<https://www2.cisl.ucar.edu/idag/archive/2015>

- ✧ **Cheng, L.**, AghaKouchak, A., An Empirical Bayes Framework for Assessing Changes in the Hydrological Cycle, AGU Fall Meeting, December 15-19, 2014, San Francisco, CA, USA  
<https://agu.confex.com/agu/fm14/webprogram/Paper23319.html>
- ✧ Luke, A., Schubert, J., **Cheng, L.**, AghaKouchak, A., Sanders, B., Predicting Flood Hazards in Systems with Multiple Flooding Mechanisms, AGU Fall Meeting, December 15-19, 2014, San Francisco, CA, USA  
<https://agu.confex.com/agu/fm14/webprogram/Paper30963.html>
- ✧ **Cheng, L.**, Analysis of Non-stationary Spatio-Temporal Climatic Extremes, ESRL/PSD Seminar Series, June 4<sup>th</sup>, 2014, Boulder, CO, USA  
<http://www.esrl.noaa.gov/psd/seminars/Abstracts/2014/cheng2014.html>
- ✧ **Cheng, L.**, AghaKouchak, A., Gilleland, E., Katz, E., Nonstationary Extreme Value Analysis in a Changing Climate: A Software Package, AGU Fall Meeting, December 9-13, 2013, San Francisco, CA, USA (AGU OSPAs Awards)  
<http://abstractsearch.agu.org/meetings/2013/FM/H41E-1275.html>
- ✧ **Cheng, L.**, AghaKouchak, A., Deriving Climate Response from CMIP5 Ensemble Climate Projections: Application to Analysis of Temperature and Precipitation Extremes, AGU Fall Meeting, December 3-7, 2012, San Francisco, CA, USA  
<http://adsabs.harvard.edu/abs/2012AGUFM.H51D1382C>
- ✧ AghaKouchak, A., **Cheng, L.**, Tracking and Nowcasting of Hurricanes: a Data Fusion Approach, 3rd World Meteorological Organization (WMO) International Symposium on Nowcasting (WSN12), 6-10 August 2012, Rio de Janeiro, Brazil  
<http://www.labhidro.iag.usp.br/wsn12/papers/ble2.pdf>